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Cosmic ray neon production at large depths: The ^{21}Ne / ^{10}Be ratio and the BeNe project.

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In-situ produced cosmogenic nuclides permit the study of and quantification of changes in geomorphic surfaces and the exposure dating of various landforms. Generally, two or more nuclides are required to independently assess surface exposure ages and erosion rates. The pair of radionuclides ^{10}Be and ^{26}Al has been widely used to obtain information on surface exposure histories. To quantify erosion effects it is necessary to calibrate the production rates below the Earth's surface. Some of the recent studies (Braucher et al 2002; Kim & Englert, 2004; Heisinger et al., 2002) have obtained approximate production rates of some radionuclides, both experimentally and theoretically, but no data exist at this time for the muon production rates of stable ^{21}Ne, which is an important nuclide in studies of erosion histories of quartz. Since ^{21}Ne is an integrating stable nuclide, it is considered to be an important source of information for long-term irradiation processes and periods of glacial cover as well as for geological processes such as uplifts. In order to estimate the production rate for muogenic ^{21}Ne to a depth of 10 m we consider the following approximations:

1. Production rates by slow muon capture: Heisinger et al (2002) discuss appropriate probability factors which may be used to study reaction pathways for ^{21}Ne and ^{22}Ne from SiO_2

2. Production rates by fast muons: Since there are no cross sections available for either ^{22}Ne or ^{21}Ne, we use a similar approach, namely to estimate those cross sections from the measured analogous reactions in Heisinger et al (2002)

Using the resulting production rates we can asses the usefulness of Ne in work where erosion rates demand the inclusion of muon reactions into overall production rates. We present model calculations of the depth dependence in the production ratio ^{21}Ne/^{10}Be and possible applications in several erosive scenarios.

In order to test model calculations, we have initiated collaborative studies with colleagues from CEREGE and University of Barcelona, namely the BeNe Project. High purity quartz samples will be collected from a 10 meter core in a quartz mine at 1260 m a.s.l. (Ourense, Spain). Calibrations of ^{21}Ne and ^{10}Be ratios measured at increasing depths will provide the necessary information to check model calculations. The ^{21}Ne measurements will be carried out at the Quaternary Geochronology Laboratory-University of A Coruña while the ^{10}Be measurements will be carried out at the new AMS facility of CEREGE.

References:

Braucher R., Brown E. T., Bourles D. L. and Colin F. (2003). *Earth Planet. Sci. Lett.* 211, 251-258.

Heisinger B., Lal D., Jull A. J. T., Kubik P., Ivy-Ochs S., Neumaier S., Knie K., Lazarev V. and Nolte E. (2002) *Earth Planet. Sci. Lett.* 200, 345-355.

Heisinger B., Lal D., Jull A. J. T., Kubik P., Ivy-Ochs S., Knie K. and Nolte E. (2002). *Earth Planet. Sci. Lett.* 200, 357-369.

Kim K. J. and Englert P. A. J. (2004). *Earth Planet. Sci. Lett.* 223, 113-126.